

BIOLOGICAL NOTES ON THE POLLEN WASP *PARAGIA (CYGNAEA) VESPIFORMIS* (HYMENOPTERA: VESPIDAE: MASARINAE) WITH DESCRIPTION OF A NEST

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Abstract

Paragia vespiformis, an endemic of south-western Australia, produces one generation of adults annually between July and October and forages at flowers of three plant families. An incomplete nest, the first described for the species, was found in sandy ground and consisted of a cell cluster at the end of a deep turretless burrow. Larval provisions were firm loaves of pollen supported on papillae.

Introduction

Members of the wasp subfamily Masarinae (*sensu* Carpenter 1982) are notable in that they provision their brood cells with pollen and nectar rather than with paralysed insect or spider prey as is usual amongst wasps. The habits of Australian masarines were virtually unknown until recently when studies were made of two species in the nominate subgenus of *Paragia* Shuckard (Houston 1984, Naumann and Cardale in press). The present paper results from the chance discovery of a single nest of *P. (Cygnaea) vespiformis* Smith in Western Australia. The nest is the first reported for the species and differs significantly from those described for *Paragia s. str.*

Paragia vespiformis is a moderately large wasp (body length 17-20 mm) and is one of the most frequently collected masarines in the South-West. As evidenced by specimens in the collections of the Western Australian Department of Agriculture and the Western Australian Museum (WAM), its geographic range extends from Shark Bay in the north to Cunderdin and Johnstone Lakes in the south with an outlying population near Sandstone.

Observations

Adult activity

From a review of specimen data in the abovementioned collections, it appears that adults fly from July until October. The earliest records are from northern localities and the latest from southern ones. The flight period at any one locality may possibly not exceed a month so that there is probably only one generation per year.

Males are recorded only for July (when no females are recorded) and August; but these records are for northern localities. Fifteen males in WAM from Balline Station were collected while alighting on the surface of a roadside pool of water (A. M. Douglas pers. comm.).

Records of forage plants are few but include Mimosaceae (*Acacia blakelyi* Maiden), Myrtaceae (*Eucalyptus oldfieldii* F. Muell., *Melaleuca nematophylla* F. Muell., *M. scabra* R. Br., *M. uncinata* R. Br. and *Scholtzia drummondii* Benth.) and Proteaceae (*Grevillea teretifolia* Meissn.).

Description of nest and nesting area

The nest was found 13 km south of Wannoo, about 209 km north of Geraldton, Western Australia, on 27 August 1984. It was in level sandy ground between dunes. The vegetation of the flat was regenerating from fire damage and consisted almost wholly of waist-high *Acacia* and *Grevillea* shrubs providing about 30% ground cover. The ground surface was largely bare except for some leaf litter beneath the shrubs.

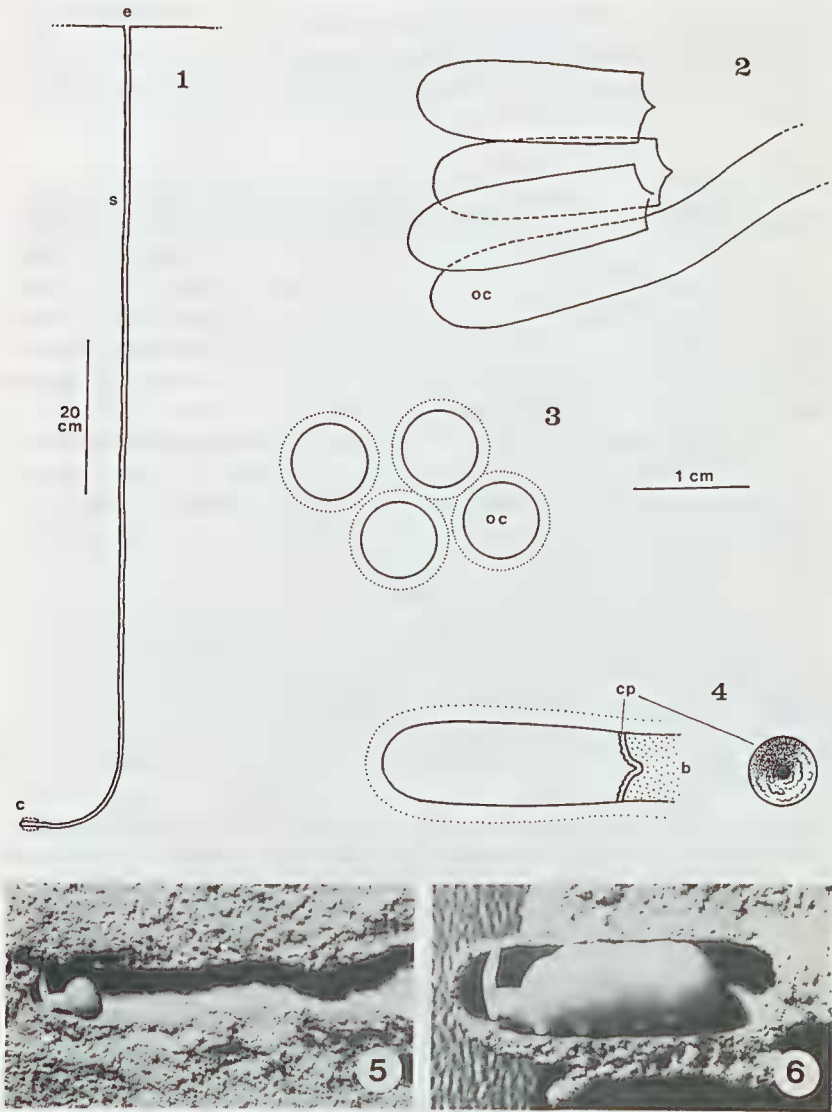
The nest entrance, a simple hole with neither turret nor tumulus, was situated in bare sand beneath a *Grevillea* bush and was revealed when the female wasp arrived and entered it (she was captured as she re-emerged and is preserved in the WAM). A search of the surrounding area failed to locate any other nests of the species but numerous active burrows of the bee *Ctenocolletes nicholsoni* Cockerell occurred throughout the flat.

Excavation revealed the soil to be uniform red sand to a depth of 3 m. Although soft and loose at the surface, it became increasingly more compacted with depth.

Below the nest entrance, a simple, cylindrical, unlined shaft, 6-7 mm in diameter, descended vertically to a depth of about 90 cm then curved to end in an open horizontal cell at a depth of 104 cm (Fig. 1) in moderately compact sand. Adjacent to and more or less parallel with the open cell were three closed cells (Figs 2, 3). All cells had cemented earthen walls about 1.0-1.5 mm thick and were removed as a cluster intact.

Each cell was rather cylindrical but had a rounded basal end and tapered slightly towards the mouth. Internal dimensions of closed cells (in mm) were: maximum diameter 6.5-7.0, diameter at mouth 5.6-6.0, length 20-21. The closure of each completed cell consisted of a septum of cemented earth about 0.5 mm thick showing a faint spiral pattern and a deep central depression internally (Fig. 4). Access burrows (except that of the open cell) were packed with sand and their connection with the shaft was obscured. The inner surfaces of cells were finished in fine soil, very smooth and matt. In the open cell, the smooth surface graded into the natural sand surface of the access burrow 20-30 mm from the cell base. Droplets of water placed on the inner surfaces of cells remained unabsorbed in the middle region but were quickly absorbed in the cell base and at the mouth.

The open cell contained a small moulded pollen mass at its inner end. The mass stood on a pair of small papillae and extended a much larger projection towards the base of the cell. Attached to this projection was a slender vertical egg (Fig. 5). The 3 closed cells were alike in that each contained an elongate pollen loaf of characteristic form with an egg attached vertically at its inner end (Fig. 6). Each loaf was comprised of 5 or 6 segments and stood on as many pairs of ventral papillae. Presumably each segment represented a separate regurgitation by the female wasp. The innermost segment resembled the small pollen mass of the open cell. Complete loaves were 14-15 mm long, uniformly moist and firm enough to be handled



Figs 1-6. *Paragia vespiformis* nest detail: (1) nest in profile [c, cell cluster; e, entrance; s, shaft]; (2) cell cluster in top view with only chambers outlined [oc, open cell at end of shaft]; (3) schematic cross-section of cell cluster [dotted lines delimit cemented earth walls]; (4) longitudinal section of completed cell and inner view of cap [b, earth barricade; cp, cell cap]; (5) open cell with egg on incomplete provision; (6) closed cell with egg on complete provision. Figs 2-4 to same scale.

without deforming. The provisions of all four cells proved to be composed of *Acacia* pollen (myrtaceous pollen was present but as it constituted less than 1% of the sample it was probably an incidental contaminant). The eggs were about 5.4 mm long and 1.1 mm in maximum diameter.

Discussion

While the above observations are few and far from complete, they serve to reinforce the emerging picture of *Paragia s. lato* as a group of solitary, pollen-collecting, ground-nesting wasps essentially little different in habits from other Masarinae; yet they also reveal some differences between *P. vespiiformis* and those of its congeners whose habits are known. We now have some insights into the nesting biology of two of the subgenera of *Paragia* but await details of the third (*Paragiella* Richards). Thus only a limited comparison may be drawn at present.

P. vespiiformis differs from species of *Paragia s. str.* in its earlier flight season, wider range of forage plants and choice of sandy soil as a nest substrate (only one nest was examined but it may be noted that sandy soils characterize all collection localities). Species of *Paragia s. str.* display a summer and/or autumn flight season, a preference for *Eucalyptus* flowers as a food source and clay soils as a nest substrate.

The nest of *P. vespiiformis* was notable for the following features (corresponding character states for *Paragia s. str.* are given in parentheses): shaft 104 cm deep (not exceeding 40 cm), turned horizontally at lower end (vertical throughout) and without an entrance turret (turrets present, except in *P. decipiens* Shuckard); cells terminal with respect to shaft and clustered side by side (lateral to and radiating from shaft), their inner surfaces matt (glossy in *tricolor* Smith); cell caps very thin with pronounced central depression (thick and flat in *P. tricolor*); provision very firm and resting on rows of papillae (soft and making broad contact with cell floor in *P. tricolor*); egg attached vertically to inner end of provision (loose and horizontal in *P. tricolor*).

Acknowledgements

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References

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